Biology

I. Knowing the Content

The professional education program provides evidence that Biology certification candidates complete a program of studies in biology the same as the academic content area courses and required electives of a major in a bachelor's degree. The program shall require the candidates to demonstrate their knowledge of and competence in teaching inquiry-based laboratory experiences and the fundamental concepts of the biological sciences to 7-12 grade students including:

I.A. Basic principles of science including:

- inorganic and organic chemistry,
- physics and mathematics,
- earth and space science

I.B. Molecular and cellular biology and the chemical basis of life including:

- atoms, molecules and chemical bonds,
- biologically important molecules,
- cellular bioenergetics, photosynthesis, and respiration

I.C. Classical and molecular genetics and the evolution and diversity of life including:

- Mendelian and non-Mendelian inheritance, probability, and environmental influences,
- structure and function of nucleic acids, protein synthesis, recombinant DNA, gene regulation, microbial genetics, and mutation,
- evidence for evolution, mechanisms, speciation, phylogeny, and the origin of life,
- diversity of life, the five-kingdom system, classification schemes, representatives of kingdoms

I.D. Structure, function and development of organisms including:

- life functions, digestion, circulation, respiration, excretion, nervous control, movement, and chemical control,
- systems that support functions, digestive, circulatory, respiratory, excretory, nervous and muscular,
- reproduction and development, gametogenesis, fertilization, growth and differentiation, metamorphosis and aging,
- instincts, learned behaviors, and communication

I.E. Ecological relationships among populations, communities and ecosystems including:

- populations, density factors, population growth, dispersion patterns, life history patterns and social behavior,
- communities, niche, interspecific relationships, species diversity and succession,
- terrestial and aquatic ecosystems, biomes, energy flow, biochemical systems, stability and disturbances, human impact and interrelationships among systems

I.F. Technological and commercial issues and applications of biological systems including:

- human population growth,
- energy production and use,
- production and use of consumer products,
- biological magnification,
- biotic and abiotic resource management

I.G. Implications of scientific and technological developments on ethical questions relating to biology including:

- gene cloning and splicing,
- prolonging life,
- prenatal testing,
- radiation and ozone depletion,
- environment,
- agriculture

II. Performances

The professional education program provides evidence of the candidates' participation in sequential and developmental field experiences and student teaching, under the supervision of college personnel and cooperating teachers who are well trained, have interpersonal skills and demonstrated competence in teaching. The program also provides evidence that the criteria and competencies for exit from the Biology certification program are assessed in coursework, field experiences and student teaching and require the candidates to demonstrate their knowledge and competence in fostering student learning through:

II.A. Managing the instructional environment in order to:

- create a climate that promotes fairness,
- establish and maintain mutual respect and rapport with and among students,
- establish and communicate challenging learning expectations to each student,
- establish and maintain consistent standards of classroom behavior,
- make the physical environment safe and conducive to learning

II.B. Planning of instruction based upon:

- subject matter,
- students and the community,
- school district standards,
- Pennsylvania Academic Standards,
- other standards that promote problem analysis, creativity and decision-making skills

II.C. Implementing, adapting and assimilating effective instructional strategies, curriculum resources and technologies

II.D. Designing, conducting and evaluating laboratory activities, using techniques, equipment and facilities that meet current technological standards including:

- computer applications to science teaching,
- hands-on laboratory experiences and equipment

II.E. Selecting, analyzing and modifying materials to meet the instructional needs and levels of diverse learners

II.F. Monitoring students' understanding of content through a variety of assessment strategies, providing feedback to students to assist learning, and adjusting instruction

III. Professionalism

The professional education program provides evidence that Biology certification candidates demonstrate knowledge and competencies that foster professionalism in school and community settings including:

III.A. Professional organizations, publications, resources, professional development and life-long learning

III.B. Integrity and ethical behavior, professional conduct as stated in Pennsylvania's Code of Professional Practice and Conduct for Educators; and local, state, and federal laws and regulations

III.C. Cultivating professional relationships and collaborating with school colleagues, organizations and other community agencies to improve student learning

III.D. Communicating effectively with parents/guardians, business and industry, and other agencies, and the community-at-large to support learning by all students